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Assessment of interobserver concordance in polysomnography scoring of sleep bruxism

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ABSTRACT

Introduction: Objective evaluation of sleep bruxism (SB) using whole-night polysomnography (PSG) is relevant for diagnostic confirmation. Nevertheless, the PSG electromyogram (EMG) scoring may give rise to controversy, particularly when audiovisual monitoring is not performed. Therefore, the present study assessed the concordance between two independent scorers to visual SB on a PSG performed without audiovisual monitoring.
Methods: Fifty-six PSG tests were scored from individuals with clinical history and polysomnography criteria of SB. In addition to the protocol of conventional whole-night PSG, electrodes were also placed bilaterally on the masseter and temporal muscles. Visual EMG scoring without audio video monitoring was scored by two independent scorers (Dentist 1 and Dentist 2) according the recommendations formulated in the AASM manual (2007). Kendall Tau correlation was used to assess interobserver concordance relative to variables "total duration of events (seconds), "shortest events", "longest events" and index in each phasic, tonic or mixed event.
Results: The correlation was positive and significant relative to all the investigated variables, being $T > 0.54$.
Conclusion: It was found a good inter-examiner concordance rate in SB scoring in absence of audio video monitoring.

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1. Introduction

Sleep bruxism (SB) is defined as a parafunctional oral activity characterized by grinding of the teeth or clenching of the jaw during sleep. Usually associated with arousals, SB is classified as a sleep movement disorder [1]. Electromyographic (EMG) events are classified as tonic (namely, sustained clenching), phasic (i.e., repeated tooth grinding events) or mixed (a combination of these two patterns) [2].

The precise diagnosis is established based on the association between clinical report, physical exam and polysomnography (PSG) [3–7]. Diagnoses based only on noise reports or on dental wear might overestimate or underestimate the SB [5,8,9]. Histories of noise are subjective and depend on the partner, as well as the partner's auditory sensitivity and sleep pattern [5,9]. In addition, SB is not systematically associated with the occurrence of noise [1]. Clinical features such as dental wear and masseter muscle hypertrophy might be related to old habits, dietary profile, occlusal pattern, dental and salivary composition or gastroesophageal reflux [5].

Whole-night PSG combined with EMG of the masseter muscle is considered the gold standard to detect muscle events, as it provides information on the intensity, frequency and type of muscle contractions [2,10,11]. The limitations of this method are variabitity of sleep bruxism, and variations due to environmental changes and audiovisual monitoring [3,9,10,12,13]. EMG scoring to detect SB demand training and precision [3]. The aim of the present study was to assess the concordance between visual EMG scoring performed by one group of dentists and one dentist alone, based on PSG with no audiovisual monitoring.

2. Materials and methods

Fifty-six PSG tests were used among individuals who had a clinical history of SB and polysomnography criteria of bruxism on the EPISONO study. The PSG was made with bilaterally electrodes on the masseter and temporal muscles. The event scoring was performed according to the American Academy of Sleep Medicine manual [2].

EPISONO is an epidemiological sleep study that was performed with a sample representing the São Paulo population in 2007. All volunteers were submitted to a single night polysomnography on sleep laboratory and to complete questionnaires before and after exam, one of these questionnaire was about SB history. The all methods of EPISONO study are described in Santos-Silva et al., 2009 [14].

Whole-night PSG was performed using a digital system (EMBLA (R) S7000, Embla System, Inc., Broomfield, CO., USA) in a sleep laboratory, at the usual sleep time. Physiological variables were simultaneously and continuously monitored: four channels for electroencephalography (EEG); two channels for electrooculography (EOG); five channels for EMG (submental area, tibialis anterior muscle, masseter and temporal areas, and seventh intercostal space); one channel for electrocardiography (ECG); two channels for air flow, through thermostat and nasal pressure; chest and abdominal respiratory effort through inductance plethysmography, snoring and body position; oxyhemoglobin saturation and heart rate [2]. Sleep staging was previously performed [15], as were the scoring of arousals [2], leg movements [2] and respiratory events (apnea was classified according to the recommended rules and hypopnea according to the alternative rules) [2].

Analysis of SB was performed by right masseter muscle (alternative option) according to the AASM [2], the audiovisual monitoring was not performed. The burst was defined as the twice of the baseline amplitude, and the events were classified in phasic, at least three bursts of 0.25 to 2 s; tonic, bursts with durations longer than 2 s; or mixed, a combination of the two. An interval of at least three seconds was being necessary to distinguish successive events.

The SB scoring was done by two independent dentists (Dentist 1 and Dentist 2). Two separate folders were organized to permit independent scoring for each other. All scorers were specialized training in sleep and polysomnography.

An automatic report was generated and printed after each scoring; the report had separate presentations for each type

Table 1 – Descriptive table: average values of examiners 1 and 2

	Dentist 1	Dentist 2	T
Phasic – index (episodes/h)	2.1±2.2	2.0±1.9	0.73*
Tonic – index (episodes/h)	2.0±1.8	2.0±1.8	0.68*
Mixed – index (episodes/h)	1.3±1.0	1.0±0.9	0.56*
Phasic – total duration (seconds)	71.4±92.7	60.5±68.6	0.74*
Tonic – total duration (seconds)	56.3±59.9	60.4±59.4	0.72*
Mixed – total duration (seconds)	87.1±86.4	66.7±78.7	0.57*
Shortest phasic event (seconds)	2.5±1.5	2.8±2.1	0.55*
Shortest tonic event (seconds)	2.2±0.7	2.2±1.1	0.47*
Shortest mixed event (seconds)	5.6±3.0	5.6±3.3	0.54*
Longest phasic event (seconds)	12.0±13.1	11.4±12.8	0.82*
Longest tonic event (seconds)	11.7±11.8	11.5±11.1	0.65*
Longest mixed event (seconds)	21.0±20	18.6±19.2	0.64*

Kendall's tau correlation.
Mean±SD
* The correlation is significant at the 0.05 level.

of bruxism event (phasic, tonic or mixed), total duration of events per night (sum of all events), duration of the shortest and longest event and index. Following data collection, Kendall Tau correlation was used to evaluate the interobserver concordance relative to the abovementioned variables in each detected event; the significance level was $p<0.05$.

3. Results

The sample was composed of 56 volunteers, the descriptive values (mean$\pm$SD) and correlations between Dentist 1 and Dentist 2 are described in Table 1. There was a high concordance between dentists, $T>0.47$.

4. Discussion

Reproducibility of the PSG-based SB diagnosis is crucial for objective measurement of the disease severity. In the present study, we did not find divergence among SB scoring according to the criteria described in the 2007 manual.

The satisfactory correlation in scoring SB by PSG without audiovisual monitoring is relevant because the most of sleep laboratories have not adequate audiovisual monitoring systems. Consequently, most PSGs diagnosis is exclusively based on EMG monitoring. The AAMS 2007 manual is routinely used in sleep laboratories, and the concordance among SB scoring according to this manual with or without audiovisual monitoring is relevant for clinical practice. In addition, the methods of score SB described in the AAMS manual do not agree with the most studies about SB.

Few studies have assessed the variability in SB (20–25%) [10,12]. In addition, there are variability between clinical report and diagnosis based in PSG (Maluly et al., 2013). However, our study support that this variability is intrinsic to SB and not be related to the EMG scoring.

As a part of their study protocol, Dutra et al. performed two different scoring of SB records according to the research criteria formulated by Lavigne et al. [16] (using the masseter) and in association with audiovisual records. In confirmation of our results, those authors found a high degree of interobserver concordance, although they performed audiovisual monitoring and used a criterion different from that formulated by AASM (2007). Carra et al. (2014) found a good concordance of bruxism score between with and without audio–video and found a good correlation intra-examiner in score bruxism without audio–video. In our study, we found the good concordance between differents examiners.

The results of this study have some limitations, as the small sample and the absence of audiovisual monitoring.

5. Conclusion

It was found a good inter-examiner concordance rate in SB scoring in absence of audio video monitoring

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